

**REMARKS**

Claims 1-4 are pending in this application, of which claims 1-2 and 4 have been amended. No new claims have been added.

The Examiner has required a new, more descriptive title. Accordingly, the title has been amended to read: UWB REPEATER WITH PULSE DELAY AND UWB COMMUNICATION SYSTEM.

Claims 1-4 stand rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent 6,108,364 to Weaver, Jr. et al. (hereafter, "**Weaver, Jr. et al.**") in view of U.S. Patent Publication US 2004/0002346 to Santhoff (hereafter, "**Santhoff**").

Applicant respectfully traverses this rejection.

**Weaver, Jr. et al.** discloses a method and apparatus for time division duplex (TDD) repeating a spread spectrum signal, where the spread spectrum signal is comprised of a series of code symbol modulated with a pseudonoise (PN) sequence. The TDD repeater receives intermittently the spread spectrum signal at a location remote from a source supplying the spread spectrum signal. The TDD repeater amplifies and delays the received spread spectrum signal by a predetermined amount. The TDD repeater transmits intermittently the delayed amplified received spread spectrum signal such that the TDD is not receiving the spread spectrum signal when it is transmitting the signal energy.

**Santhoff** discloses an ultra-wideband geographic location system, and FIG. 13 shows UWB units 1110 which can relay information to UWB requesting unit 1105.

**Santhoff** fails to disclose any delay between the reception and transmission of the UWB pulses, and the delay taught by **Weaver, Jr. et al.** is for CDMA spread spectrum signals, which are not individual pulses, as are the UWB pulse signals. Thus, these references may not be combined to teach a transmitting timing which is different from the receiving timing by a pulse unit, as recited in claim 1 of the instant application.

Page 18, lines 2-3 of the specification of the instant application discloses that “it is difficult to apply various types of repeaters conventionally used to UWB.”

In particular, it should be noted that the following descriptions appear in **Weaver, Jr. et al.**:

- (1) “The switch switches on and off at a rate higher than the symbol rate. The delay device provides a delay equal to approximately one half the duration of the switching period.” (see Column 6, lines 40-43);
- (2) “Note that there is no need to synchronize the switching at the repeater to the PN codes or symbol boundaries.” (see Column 6, lines 59-60);
- (3) “In the exemplary embodiment of the present invention, the symbol rate is 19.2 ksp/s which is equivalent to a symbol duration of approximately 52 microseconds ( $\mu$ sec).” (see Column 10, lines 19-21);
- (4) “For example, the preferred embodiment might have a 3  $\mu$ sec. switching rate and a 1.5  $\mu$ sec. delay.” (see Column 10, lines 25-26);
- (5) “Thus only those time segments corresponding to odd numbers are transmitted by the TDD repeater. The signal energy corresponding to the even time segments is lost due to the TDD nature of the repeater.” (see Column 11, lines 29-32 and the three upper lines of FIG. 5);
- (6) “...note that at the output of the delay device only those time segments corresponding to every other odd number (i.e., 1, 5, 9, 13, 17) are aligned with the transmission indications on time line 206. The signal energy corresponding to the

remaining odd time segments (i.e., 3, 7, 11, 15) is lost due to the TDD nature of the second repeater" (see Column 14; lines 16-21 and the three lower lines of FIG. 5).

More specifically, Weaver, Jr. et al. provides a repeater that divides one received 52  $\mu\text{sec}$ -wide pulse (symbol) into strip forms consisting of approximately 17 ( $\approx 52 \mu\text{sec}/3 \mu\text{sec}$ ) 1.5  $\mu\text{sec}$ -wide narrow pulses and also provides a delay corresponding to the pulse width (1.5  $\mu\text{sec}$ ) of each of the pulses thinned down into narrow segments for transmission. Therefore, the amount of delay is 1.5  $\mu\text{sec}$  to the received pulse width 52  $\mu\text{sec}$ , so that the repeater does not transmit a received pulse series with a delay by a pulse unit, as recited in claim 1 of the present application.

Furthermore, as described above, according to Weaver, Jr. et al., the repeater transmits a received pulse in a manner thinned down in strip forms. Therefore, the time of duration of a pulse relayed in one try is reduced by half and is reduced to one fourth for two times of relaying (see the three lower lines of FIG. 5), and the relayed pulse is immediately eliminated by a few times of relaying, so that the repeater does not transmit received pulse series with a delay by a pulse unit, as recited in claim 1 of the present application.

Santhoff discloses how a UWB communication system relays information. However, there is no description of the relaying pulse series of the present invention.

Thus, the claims of the present application differ from Weaver, Jr. et al. in the following ways:

- (1) In claim 1 of the present application, the transmitted and received pulse series signals are UWB pulses, while in Weaver, Jr. et al., there is no description

regarding this point;

- (2) In claim 1 of the present application, pulse series signals received by a receiver at a transmitting timing different from the receiving timing "by a pulse unit" are transmitted from a transmitter, while in Weaver, Jr. et al., there is no description regarding this point;
- (3) In the claims of the present application, pulse series signals received by a receiver are transmitted from a transmitter, while in Weaver, Jr. et al., signals obtained by thinning down pulse series signals received by a receiver are transmitted from a transmitter.

Claim 1 of the present application results in a relay that prevents a sneak path wave from the transmitting side to the receiving side which can be realized with a remarkably small delay (see paragraph [0044] of the substitute specification of the instant application). However, in comparison with Weaver, Jr. et al., for relaying received signals in a manner thinned down by half, received signals are all one hundred percent relayed in claim 1 of the present application. Therefore, in Weaver, Jr. et al., signals are reduced by half in one time of relaying and the signals are immediately eliminated by a few times of relaying, while there is no signal deterioration resulting from relaying in claim 1 of the present application.

The invention according to claim 4 of the present application originally differs from the repeater of Weaver, Jr. et al. in the subject matter of the invention, and is directed to a communication device that receives receiving data and transmits transmitting data, and relates to

setting of timing between transmitted pulse series signals and received pulse series signals. This feature is not described in either of the cited references.

Consequently, a sneak path wave between the transmitting side and receiving side can be resolved, and it is possible to easily realize a UWB communication system capable of carrying out bi-directional communications (see paragraph [0040] of the substitute specification of the instant application).

Thus, the 35 U.S.C. § 103(a) rejection should be withdrawn.

In view of the aforementioned amendments and accompanying remarks, claims 1-4, as amended, are in condition for allowance, which action, at an early date, is requested.

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact Applicant's undersigned attorney at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

U.S. Patent Application Serial No. 10/719,028  
Response to Office Action dated October 3, 2006

In the event that this paper is not timely filed, Applicant respectfully petitions for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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